REMARKS

In the current Office Action, the Examiner rejected claims 1 and 3/1 and objected to claims 2 and 3/2 for relying on a rejected parent claim. Applicant thanks the Examiner for indicating that claims 2 and 3/2 would be allowable if rewritten in independent form.

Rejections under 35 U.S.C. § 103

In the Office Action, the Examiner rejected claims 1 and 3/1 under 35 U.S.C. § 103(a) as being unpatentable over the Mann reference (U.S. Patent No. 5,828,793) in view of the Umemura reference (U.S. Patent No. 4,590,582). Specifically, the Examiner remarked:

> Mann discloses a method of creating an image with a still video camera (col. 11 lines 43-46, figure 8, element 202). Mann further teaches that the image is transferred to a computer to be stored on a main memory 210 represented as 212_1, 212_2, 213_3 etc. (col. 11 lines 46-54). Mann also teaches that the composite images [are] formed from a series of input images wherein every pixel of the composite image is drawn from the corresponding pixel in each of the input source images according to a weighted average. The weighting is based on a certainty function associated with each source image pixel corresponding to an output pixel in the final composite image. The value of the relevant pixel parameter for a given final-image pixel (weighted average of n samples) is given by
>
> $$\sum_n c_n P_n / \sum_n c_n$$
>
> where c_n is the certainty function associated with the corresponding pixel of each source image n (col. 6 line 51-col 7 line 8). It is noted that P_n (pixel parameter) is dependent upon exposure time, brightness or luminance and the gain of the system. Mann teaches that the resulting pixel image represented

> by the expression above is saved in a target buffer 250 whose contents are shown on screen display 234 (col. 12 lines 32-49). The features such as gamma correction (other image data) are also stored in the target image data (col. 13 lines 4-8).
>
> Mann fails to teach explicitly obtaining a substantially linear representation of the image by combining two images. However[,] Umemura teach that when various parameters are used for one original image data, the image data filtered by the 3.times.3 filter 2 and stored in the memory 3 is read out for each such parameter. Then, the original image data and the filtered image data are subjected to linear combination by the adder device 5 in order to achieve high-speed processing (col. 8 lines 23-39, figure 9, also see col. 7 line 53-col. 8 line 23, figure 1).
>
> Therefore taking the combined teachings of Mann and Umemura, it would be obvious to one skilled in the art at the time of the invention to have been motivated to have obtained a substantially linear representation of the image by summing two images in order to achieve high- speed processing as taught in Umemura (col. 8 lines 23-39).
>
> [Claim 3/1]
>
> Mann teaches that the different images are color so that the offset will be color dependent (col. 13 lines 21-30).

Final Office Action, pages 4 and 5.

Applicant respectfully traverses this rejection. The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). Even if, *ad*

arguendo, the references *could* be combined or modified in the proposed manner, it does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *See In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d. 1430 (Fed. Cir. 1990). Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985).

Features Missing from the Cited References

Independent claim 1 recites, *inter alia*:

> ... calculating an estimate of the true image intensity (i_{xy}) as a weighted average of n samples of the apparent image intensity ($v_{n,xy}$) as

$$\hat{i}_{xy} = \frac{\sum_n \left(w_{n,xy} \left(\frac{v_{n,xy} - C}{K T_n} \right) \right)}{\sum_n w_{n,xy}} = \frac{1}{K} \frac{\sum_n \left(w_{n,xy} \left(\frac{v_{n,xy} - C}{T_n} \right) \right)}{\sum_n w_{n,xy}}$$

> where $v_{n,xy}$ is the apparent intensity measured, n is greater than or equal to 2, T_n is the exposure time, K is the gain of the system, C is an offset and $w_{n,xy}$ is a weighting factor which is defined to maximise the signal to noise ratio and discard insignificant, that is saturated or near zero, values signal to noise ratio and discard insignificant, that is saturated or near zero, values; ...

The method of the present invention results in a digital image whose values are related linearly (i.e. directly proportional) to the intensity of light falling on the sensor, even when there is a very wide range of such intensities. This achieved by a taking series of images using different exposure times, thresholding to remove the effects of saturation, and determining the appropriate weighing factor to be applied to each pixel of each image.

The new citation, Umemura, teaches multiplying and adding two images together which has little to do with the method of the present invention. Umemura describes a method in which is calculated a "linear combination of" two images (using the term "linear" in yet another way to Mann and the present invention).

Combining the teaching of Mann and Umemura would not produce an image whose values were linearly related to the light intensity. In fact, the calculation step of Umemura would just blur or sharpen each of the individual source images.

Mann teaches how to calculate an output image, each of whose pixels are calculated by combining the corresponding pixels from each of a number of source images. As the Examiner has already accepted, Mann does not teach how to make each pixel's value proportional to the light intensity at the pixel location. Mann does not teach how to derive the weights so as to result in a linear relationship between light intensity and digital value. Mann simply combines a number of images taken at different

exposures. Mann does not discuss altering the spatial characteristics of the image, which would be achieved by combining pixels taken from different locations.

Umemura teaches how to achieve a user-controlled modification of the spatial frequency characteristics of a single source image. Umemura does not discuss a process that combines a number of source images. The technique of Umemura combines pixels from different locations in the single source image.

To combine the teaching of the two documents is non-obvious. In the unlikely event of a skilled person considering combining the teachings from the two documents there are two ways in which this might be done:

(1) The source images could be spatially filtered according to Umemura and then processed according to Mann. The spatial filtering, however, would destroy the relationship between light intensity and pixel value within each source image that is essential for Mann's algorithm. Further, the final result would be spatially filtered and therefore not reproduce faithfully the frequencies of the source images. Finally, it would not provide a result image in which each pixel's value is proportional to the light intensity at the pixel location.

(2) The source images could be combined into a single image according to Mann and then spatially filtered according to Umemura. In this case

each method would 'work' independently within its own terms of reference. However, it would not provide a result image in which each pixel's value is proportional to the light intensity at the pixel location.

Accordingly, it clear that is not obvious to combine the teaching from the two documents, and, even if the documents were combined, it is not possible to arrive at the result of the present invention.

As was explained in the telephone interview with the Examiner, the present invention, like Mann's, combines only spatially corresponding pixels from each source image to calculate each pixel in the result. To do otherwise (that is, to combine pixels from other locations) would destroy the information necessary to perform the calculation correctly. (For example, if a 3x3 spatial filter were used to combine neighbouring pixels and some of those pixels were 'invalid' because they were saturated, it would not be possible to determine whether such saturation had taken place). The present invention differs from Mann's, however, in that it teaches how to combine the pixels in order that each output pixel is directly proportional to the light intensity at the pixel location. The fact that Umemura teaches a method in which a result is formed by a weighted sum (otherwise referred to as a 'linear combination') of two other images - a step that must appear in just about every digital image processing operation ever designed - does not mean that it provides any teaching on how to achieve an output image whose pixels are directly proportional to light intensity.

For these reasons among others, Applicant respectfully requests withdrawal of the rejection under 35 U.S.C. § 103 and allowance of all pending claims.

Conclusion

The Applicant respectfully submits that all pending claims are in condition for allowance. However, if the Examiner wishes to resolve any other issues by way of a telephone conference, the Examiner is kindly invited to contact the undersigned attorney at the telephone number indicated below.

In accordance with 37 C.F.R. § 1.136, Applicant hereby provides a general authorization to treat this and any future reply requiring an extension of time as incorporating a request thereof.

Respectfully submitted,

Date: February 15, 2007

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